

Method and arrangement for producing elongate support element and product, and use of the support element.

TECHNICAL FIELD

The present invention relates inter alia to a method for producing elongate support element with associated seats for replacement structure in human body (jaw), via which seats the support element can be applied to implants and/or to spacers on these implants. The longitudinal axes or centre axes of the seats connect with or are parallel to the longitudinal axes or centre axes of the implants in order to satisfy set accuracy of fit requirements which can be about 2/100 mm. The method starts from the stages of identification and possible modelling of the dental situation in question, supplying information, extracted from the identification and modelling, to computer equipment, operating the computer equipment to use the supplied information and further information input to the computer to simulate and determine the structure of the support element in or at the replacement structure, extracting, from the computer equipment, milling coordinates information or milling coordinates data used for controlling the milling of a blank in milling equipment, transmitting the milling coordinates information and milling coordinates data to the milling equipment and controlling the milling work equipment to produce the support element from the blank.

The invention also relates to an arrangement for producing elongate support element with associated seats for replacement structure in human body/jaw, via which seats the support element can be applied to implants and/or to spacers on these implants, where the centre axes of the seats are arranged to connect with or be parallel to the centre axes of the implants so that set accuracy of fit requirements are satisfied. The arrangement comprises identification members and possibly modelling members for identification and,

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9304042-6 and 9402351-2. It is also known per se to make recesses in dental products by means of so-called direct milling of the product material.

DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

In connection with the abovementioned methods and arrangements for producing dental products in the form of support elements, there are requirements for very great accuracy in the seat application. The required accuracy is, in accordance with the above, at least about 2/100 mm, and the requirements are set in order to be able to satisfy exact fitting in the jaw or equivalent. Poor fitting gives rise to stresses in the dentine or equivalent and causes discomfort and pain and even collapse of the bone in question, at least in the longer term. This has entailed comparatively technically complicated methods and arrangements for seat applications. The said methods include, inter alia, seat production by means of electro-erosion, in which a produced model is used as electrode part. The hitherto proposed methods and arrangements can include production of modules which are welded together (by laser welding) to form the final support element. Before the modules are put together, seat application can take place separately in one or more modules, for example by means of mechanical or optical measurement. However, the result of welding is a nonhomogeneous material in which the strength varies in the support element. Cavities may possibly arise in the material on account of the melt zone not penetrating down deep enough. When grinding or surface-machining the support element to adapt the shape, such cavities can become exposed, which means that the exactness or fit accuracy requirements cannot be satisfied. It has also been proposed to produce support parts by means of casting processes. In casting, there is the problem that the material may buckle upon cooling. The surface fineness

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the support element shape determined in the computer equipment from the blank using the milling equipment, also to be used to control the milling equipment to shape and position the said seats directly in the blank/support element material using the information likewise set in the computer equipment.

A product according to the invention can principally be regarded as being characterized in that the support element is made of homogeneous material and in that each seat wall is executed directly from the homogeneous support element material.

In embodiments of the inventive concept for the product, each seat wall can consist of a surface ground directly in the homogeneous material. The product can also have a material strength around each seat which essentially corresponds to the material strength of the rest of the support element material. In a further illustrative embodiment, each seat wall is formed directly from the support element material without intermediate layers of material compositions or material alterations. Each seat wall thus has the same chemical composition as the rest of the support element material.

A use according to the invention can be characterized in that the recessing is used for receiving the seats in the product in the form of a support element included in tooth replacement structure. The said seats must in this case have fixed accuracy of fit requirements in order to be applied to implants located in the human body and/or to spacers on these implants.

In one embodiment for recessing which is used for forming a seat in the support element with milling equipment, this milling coordinates information is supplied in the form of milling coordinates data executed in database equipment and attributable to identification data on the design of the tooth replacement structure and supplementary data fed to the computer equipment. The information supplied from the

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FULL-SCALE

In accordance with the invention, the dental situation is to be read off using identification equipment 12 which can also be of a type known per se. The reading can be effected in various ways known per se, for example by stereophotography, scanning of the outer form, etc. The scanning of the outer form can be performed using scanning needles, optical light beams, etc. The identification function is symbolized by 13 in the figure. The identification in question leads to a conversion to electrical information signals. This conversion takes place, in the illustrative embodiment, in conversion equipment 14. The conversion equipment

known programs in the computer equipment and are thus part of the said milling coordinates data 19.

In Figure 2, the positions and inclinations of the seats are shown enlarged in relation to Figure 1. In Figure 2, two of the seats have been given reference labels 22 and 23 (cf. Figure 1). The centre axes of the seats are indicated by 24 and 25, respectively. These centre axes must be adapted with great precision to the corresponding axes of inclination of the implant (cf. the centre axes 8 and 9 in Figure 1).

Figure 3 shows that equipment known per se can be used for making a seat 26 in the support part material 27. In Figure 3, a mill is indicated by 28. In addition, a grinding member is indicated by 29. The mill can thus mill out the recess 26, after which the seat wall 26a can be re-ground using the member 29. The known equipment 28 for making a hole can thus be used for making the seat 26 in the case according to Figure 1. The milling equipment 20 can work in a manner known per se. In Figure 1, second transmission members are shown by 15c for transmitting the information 19 to the machining equipment 20. This transmission can be done in a manner known per se and is symbolized by 15d. Thus, for example, the transmission can be done by the telephone and/or computer network, for example via the international computer network, the internet. The transmission between the first transmission members 14, 14a and the computer equipment can take place on a fixed connection, for example when the said equipment is integrated or set up in the same locality. However, the transmission, which has been symbolized by 14b in Figure 1, can also take place via the telephone and/or computer network, for example via the said international network, the internet. Alternatively, one or both transmissions can take place with the aid of cassettes which are sent between the localities in question.

The invention is not limited to the embodiment shown above by way of example, but can be modified

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